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ABSTRACT

In the past decade significant advances have taken place in the development of management information systems (MIS) to support managerial decision making. Recent literature has shown, however, that educators have yet to make full and efficient use of these computer-based systems. A number of authors have discussed factors that may affect administrative use of the MIS. These variables are: (1) the quality and character of the MIS; (2) the decision environment, which includes organizational influence and cost/value considerations; and (3) the confidence of the administrator. Because most technological difficulties with MIS were largely overcome during the 1970s, focus is shifting to examining behavioral issues critical to effective use of MIS by decision makers. Learning theory suggests that successful implementation of MIS can be accomplished by making administrators active participants in their learning. New strategies for implementation include (1) involving the administrator in the system's development and testing, (2) making the administrator part of the facilitating team, (3) holding training sessions outside of the regular workplace, and (4) including "hands on" operations of computer terminals. Six figures are included, and a one-page bibliography is appended. (IW)

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Implementation of Computer Based Management Information Systems: A Behavioral Prospective

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In our continuous movement toward the twenty-first century, our age is often characterized by an on-going explosion of information and related technological developments. Drucker (1969) has projected that "the impact of cheap, fast, and universally available information will easily be as great as was the impact of electricity." Coping with these changes has become a continuing necessity. To deal with these developments organizations have spent vast sums of money and time on computers and information systems. It is suggested that computers have had a greater impact on modern organizational management than any other development. However, in the past decade significant advances have taken place in the development of information systems to support managerial decision making. These management information systems (MIS) range from a relatively low to a high level of sophistication. They are likely to include one or more of the following capabilities: information retrieval from queries, report generation, arithmetic calculations, quantitative functions and modeling. While there may not be a concensus on what constitutes an MIS, they are generally computer based and function primarily to aid decision making. The computer can process and output enormous quantities of data in a myriad of forms at lightening speeds. How this data is perceived and used by educational administrators is the important question. The influence and effects the data have depends on the educational decision makers and the environment as well as the information system. What is needed is an effective coupling of the decision maker with the computerized information system to enhance the decision making process.

But what has their impact been on managerial decision making? Have decision makers taken advantage of this explosion? Is managerial performance being improved because of increased availability of information and related technology?

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The literature suggests that an effective coupling of the decision maker and the MIS has not taken place. Lucas (1975) states that some systems have been withdrawn because they have proved unworkable, and others continue to operate though no one uses their output. Schewe (1976) concluded that current, or planned computer-based management information systems and other usage fell far short of their theoretical capabilities. This failure of MIS to live up to its expectation is supported by the research of Ackoff (1967), Couger (1968), Dickson and Powers (1973), Diebold (1969), Lucas (1976), and Weinwurm (1970).

The question thus arises, why haven't these information systems been more successful; or from a research perspective, what factors or conditions will cause decision makers to make more effective use of MIS and be more willing to use them in the future?

Periodically, a technologically oriented response has been given to the question of why haven't these management information systems been more successful. These responses generally stated that the necessary advanced technology was not available, or was not sufficiently implemented in educational organizations. This lack of advanced technology caused designers to develop systems which did not respond to management's needs. The faults that have been mentioned with these systems include: inability to integrate data, slow response times, allocation of the computer to other tasks during large parts of the day, and physical separation of machine access from decision makers.

Even if these reasons contributed to the lack of success of MIS in the 1960's, they were largely overcome in the 1970's. The advances in computers and computer related technology have been phenomenal. The increases in computing speed, memory capacity and speed, and reliability have been by orders of magnitude. During these years, software-based concepts, e.g., multiprograming, time sharing, etc. have increased the throughput of computer processing jobs. These trends can be expected to continue well into the 1980's. (Turn, 1974). Thus the technological environment seems adequate for the development of sophisticated MIS.

As the focus has shifted from technological concerns, behavioral issues have come to the fore. Specifically, is there something in the decision maker - MIS interface - that is critical to effective use of MIS by decision makers?

In examining the decision making process no one is quite certain how administrators go about making their decisions. However, it is subjective and varies greatly from one person to another. It is also known that some administrators make better decisions than others; better in the sense that the decision has helped improve the performance of the organization. A reasonable assumption is that the decision making process can be broken down into problem finding, i.e., determining when a decision should be made, and problem solving, i.e., selecting a course of action. The problem finding component can be expressed as the question of: when should an administrator take action to control the use of a resource?

In almost all situations an administrator's experiences, behavioral style and role environment affect his decision process. He goes about searching the enviornment for conditions requiring decisions, i.e., problem finding. Throughout this search, he may not be consciously aware of what are the critical decisions and key variables.

Today, administrators get most of this information as data suggested by others. While some of the data comes directly from others, much of it comes partially or wholly on computer produced reports. One aspect of these computer reports is the very large amounts of data that they furnish. Often administrators feel inundated with the data and have difficulty coping with the volume. It is not uncommon to enter an administrators' office and find reams of computer reports stacked up and often unused. Perhaps administrative inability to deal with the information overload may be a major cause of the lack of use of MIS. A fundamental question arises as to how can we design an efficient and effective information system to support an administrator when his goals, perceptions, and often decision processes may change, and change unpredictably?

The aforementioned conditions could be used to describe today's environment for using information systems in administrative decision-making. This enviornment can be characterized as follows: dynamic, multidimensional, partially structured with complex inter-relationships, requiring

administrative judgement, affected by behavioral process, involved with large amounts of data, subject to information delays and missing or inaccurate data, lacking in precision, influenced by computer technology and MIS design, dependent upon expectations and subjective probabilities, having large monetary and human value effects and built around the financial structure of the community and organization.

Thus the design and implementation of the management information system must consider these characteristics. It is quite apparent that these characteristics produce a complex environment: an environment where both behavioral and technical issues have major impacts.

One way to develop a framework for conducting any form of research is to start with a simplified model. The model should contain the key classes of variables of concern. These classes of variables can then be expanded and explored by relating them to the theory and findings of others.

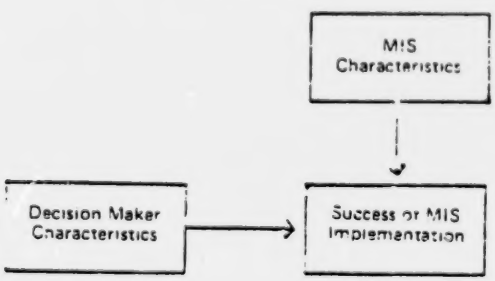
Management information systems are developed so that they will be used by decision makers. Therefore, one major variable in the research framework for MIS is a measure of the success of MIS implementation.

Since the topic of this discussion is successful implementation of MIS, some characteristics or qualities of the information systems must affect their success. Thus, MIS characteristics become the second major variable in the simplified model.

Thirdly, the decision maker chooses to use or not use the MIS. Therefore, it is reasonable to assume that some characteristics or qualities of the decision maker will affect his use and thus the success of the MIS. The characteristics of the decision maker becomes the third variable in the research framework for MIS. These three variables form a simplified model. Their relationship is shown in Figure I.

Figure 1

A Simplified Model for MIS Research



Chervany, Dickson and Kozar (1972) proposed a framework for research in MIS which included these significant features. First, their framework contained measurable dependent and independent variables. Second, it contains the three variables in the Simplified Model, plus one additional variable, the decision environment. Their model suggests variables that should be examined for their impact on decision effectiveness. The Model is shown in figure 2.

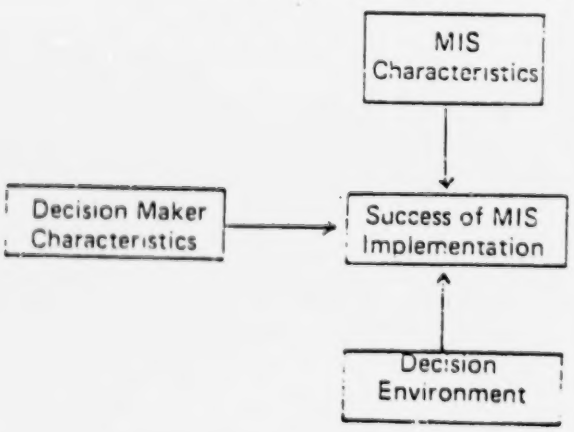
Figure 2

Independent variables			Dependent Variables
The Decision Maker	The Decision Environment	The Characteristics of the Information System	Decision Effectiveness
1. Indirectly Acquired Attributes - Aptitudes - Attitudes	1. Function - Finance - Production - Marketing - Personnel - R & D etc.	1. Format - Content - Form - Presentation Media	1. Quality of MIS - Cost - Profit - Time - etc.
2. Directly Acquired Attributes - Training - Experience	2. Level - Strategic - Tactical - Operational	2. Time Availability	
	3. Environmental - Stability - Competitiveness - Time Pressure	3. Decision Aids	

The three independent variables provide the basis for expansion of the Simplified Model as shown in Figure 3.

Figure 3

An Expanded Model for MIS Research



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Support for this Expanded Model comes from the conceptualization of Mason and Mitroff (1973). They state that "an information system consists of at least one person of a certain psychological type who faces a problem within some organizational context for which he needs evidence to arrive at a solution (i.e., to select some course of action) and that the evidence is made available to him through some mode of presentation. Their model consists of the variables emphasized in their quote. Their conceptual basis for research is on the process of using information systems to support decision making. Their focus is to give each type of decision maker the kind of information he is psychologically attuned to and will use most effectively.

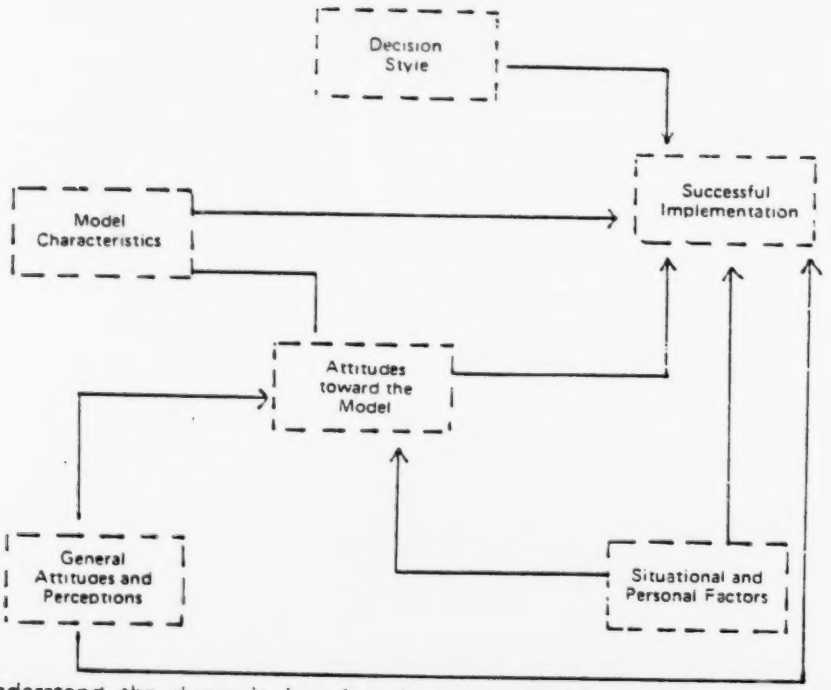
A constant theme throughout this discussion has been the importance of MIS success. It was suggested that administrators must accept and use MIS for them to succeed. It also seems reasonable that for administrators to continue their acceptance and use of MIS, their usage of same should have positive effects on the administrator's decision performance.

The goal of any aid for decision making is to improve the effectiveness of the decision. Yet in the "field" it is quite difficult to identify the independent variables causing improved effectiveness. Dickson, Senn and Chervany (1977) state that "laboratory studies appear to offer the most immediate promise for improvements in the current state-of-the-art on information systems analysis and design."

Lucas (1975) developed a descriptive model of information systems in the context of the organization from organizational behavior and information systems literature. The model focuses on three crucial variables: user attitude and perceptions, the use of systems, and user performance. Based upon continued research, Lucas (1976) presented an updated model. He suggests that high levels of use is an indicator of successful implementation and that attitudes are a good predictor of behavior. It is assumed that favorable attitudes are associated with high levels of use. This updated model consists of six classes of variables and is shown in Figure 4.

Figure 4

Lucas' Research Model



To better understand the dynamic interface between implementation and use of information systems in administrative decision making, we must identify the factors or conditions that influence a decision maker when he is learning to use the MIS. Specifically, which variables lead to earliest learning, best performance and most favorable attitudes and confidences. In essence, the implementation is a trial period in which the decision maker learns and explores the benefits of using the MIS before accepting or rejecting it as an aid to his decision making.

A number of authors have discussed factors that may affect administrative use of MIS. One group of factors is related to the quality and character of the MIS. These include the type of interaction with the user, output media and form, decision aids, etc. The information requirements would vary with the type and timing of problem finding and problem solving.

A second group of variables encompass the decision environment. Included would be the level, structure, importance and functional area of the decision. Organizational influence would be a part of the environment, such as upper administrative support and peer group pressure. Economics enters here under cost/value considerations.

A third group of factors influencing administrative decisions to use an MIS are personal to the decision maker. These factors can be separated into:

A. The attributes a decision maker possessed at birth or acquired throughout his development. These factors would include his aptitude and decision style.

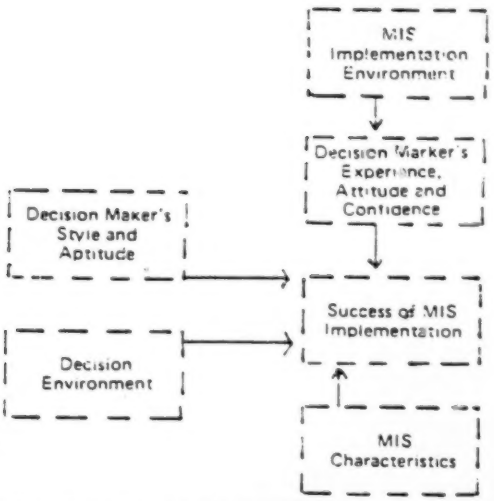
B. The attributes a decision maker acquired directly in the recent past. These factors would include his experience, attitude and decision confidence.

Research has only recently begun in these areas. Much of it is exploratory or suggestive. None of it has been able to explain most of the variance in MIS use.

When deciding to use an MIS, a decision maker is affected by his experience, cognitive style, organizational pressure and the decision environment; as well as by the information system and information available. Learning theory tells us that people tend to use methods that have been successful for them in the past. They also rely on communications from others and observations of what are useful. It is not surprising that administrators are reluctant to change their ways and use of MIS. However, if this is true, then the question arises as to how can successful implementation of MIS be accomplished? Perhaps first, by paying more attention to the learning and change process in getting administrators to use an MIS. Secondly by allowing administrators to go through the learning process more in the style to which they are accustomed. These factors can be grouped into a class of variables called the MIS implementation or learning environment. Through the conditions set up in the implementation environment, a decision maker's experience, attitude and confidence is shaped. These directly acquired attributes should exert a strong influence on a decision maker's future use of an MIS. All of these classes of variables for the MIS Research Model as shown in Figure 5.

Figure 5

The MIS Research Model

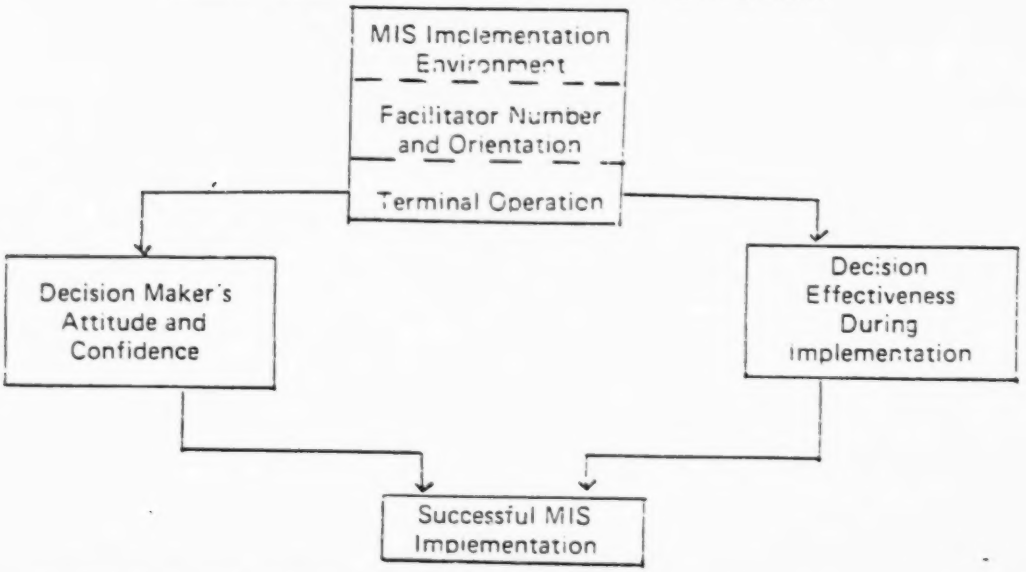


Change is often resisted. It is resisted because of fear of failure and fear of the unknown. As administrators learn to use the new information systems they may make a number of mistakes and may make less effective decisions than they otherwise would have made. To overcome these influences the administrator must feel supported and encouraged as they learn. The administrator must place confidence in the people and methods helping them with the transition. The administrators must develop favorable perceptions and attitudes until they can see positive results in their decision effectiveness. The key to the change process may be the facilitator or change agent, a skilled individual who guides the transition.

What is important is administrative involvement. By making administrators active participants in their learning during the implementation of the MIS, their resistance should be diminished and their attitudes open to change. When the administrator directly operates the computer terminal, he becomes active in his learning environment. The process of this perspective is shown in Figure 6.

Figure 6

Research Model of the MIS Implementation Environment



This discussion suggests that much more concern must be given to how information systems are implemented. Administrators and systems analysts responsible for introducing new MIS must get potential users involved in learning to use the MIS. The implementation is a trial period. If the users resistence to change is not overcome during implementation, the chances are slim that they will later accept and use the MIS. This will perpetuate the general lack of success of most MIS, with the resulting problems of: withdrawal and underuse of the systems, costs exceeding benefits, and discouragement and turnover of competent systems personnel.

What is needed is a strategy for implementation that is as important as the technical capability of the information system. Implementation must be well planned and given adequate developmental time. a team approach should be used to facilitate or guide learning. Part of the team should be oriented toward the user. One way to accomplish this would be to take an interested decision maker, who is a potential user, include him in the system's development and testing, and then make him part of the facilitating team.

Introduction, learning and trial should take place in an educational like setting, not in the decision maker's regular workplace. The purposes are to get the decision maker involved in learning to use

the new MIS, not to rely on their existing methods but to try new ones in support of their decision making, and look to the facilitators for assistance.

The learning period should include "hands on" operation of the computer terminals, even if the decision makers are not going to operate the terminals later, during regular system operation. How they get introduced to the terminal operation and the degree of assistance with terminal operations, should vary with the complexity of the system.

A strategy such as this should promote positive attitude and behavioral change during implementation. This positive response should then increase the likelihood that decision makers will use the computer based information systems in the future.

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